



The impact of surgical interventions on patient health and well-being in Guatemala: the 2013 mission



By Scientific Technologies Corporation in partnership with the Healing Hands Foundation

March 2014

Summary

The Healing Hands Foundation (THHF) provides high quality, free surgical procedures, medical treatment, dental care, and educational support in Guatemala. Through established in-country partnerships, THHF engages with communities to identify and treat patients, improve health care infrastructure, and provide needed medical training to surgeons, doctors, and community health care workers. Despite Guatemala's middle income status, health outcomes here compare unfavorably with those of other much poorer countries. Child mortality (43 per 1,000 live births) and maternal mortality (136 per 100,000 live births) are the highest in Central America. Guatemala experiences extreme inequalities that reflect the exclusion and disparity affecting the indigenous and rural populations. According to the World Health Organization, 20% of Guatemala's people lack regular access to health services (2), and these people represent the poor, rural, young and indigenous. Chronic malnutrition and inadequate health education remain major problems among the rural indigenous communities. These communities face a series of barriers to health care including transport time and cost, language barriers, low or no literacy and the time and cost of consult and treatment.

In November 2013, 35 medical and dental professionals traveled to Patzún, Guatemala, for THHF and performed surgeries and provided dental care to people in need. These volunteers consisted of trained surgeons, fellows, nurses, cardiologists, dentists, nurses, anesthesiologists, epidemiologists and medical technicians. We performed 50 surgeries on 49 patients, ages 2 to 68 (27 male, 23 female). By estimating total DALYs averted due to surgical intervention, THHF mission activities saved 364.42 total years of life among their patient population. Cleft palate and hernia repairs accounted for the majority of these years.

Future expansion of THHF services relies on effective and reliable data collection to improve worksite capacity and patient safety, and a comprehensive analysis to evaluate program effectiveness and identify new areas to expand our impact while protecting patient privacy.

Acknowledgements

We would like to thank all the diligent volunteers from THHF and the THHF Guatemala Branch, who professionally and collaboratively work to provide support and mentorship to the Guatemalan people. We thank the following organizations for their generous support for our missions: Direct Relief International, American Airlines, RTS Family Foundation, Scientific Technologies Corporation, MAP/Ethicon and the THHF-Guatemala Board of Directors (Steven Gandara, Carlos Caballeros, Beira de Caballeros, Antonio Bonifasi, Rosario de Bonifasi, Michael Spencer, Giovanna de Spencer and Mark Melidosian). We thank Marco Ávila and Steven Gandara for their leadership and logistics skills that make our work possible. Thank you to Curtis Smith, photographer for the photos used in this report. We also deeply appreciate the hospitality and collaboration from the caring staff at Corpus Christi hospital.

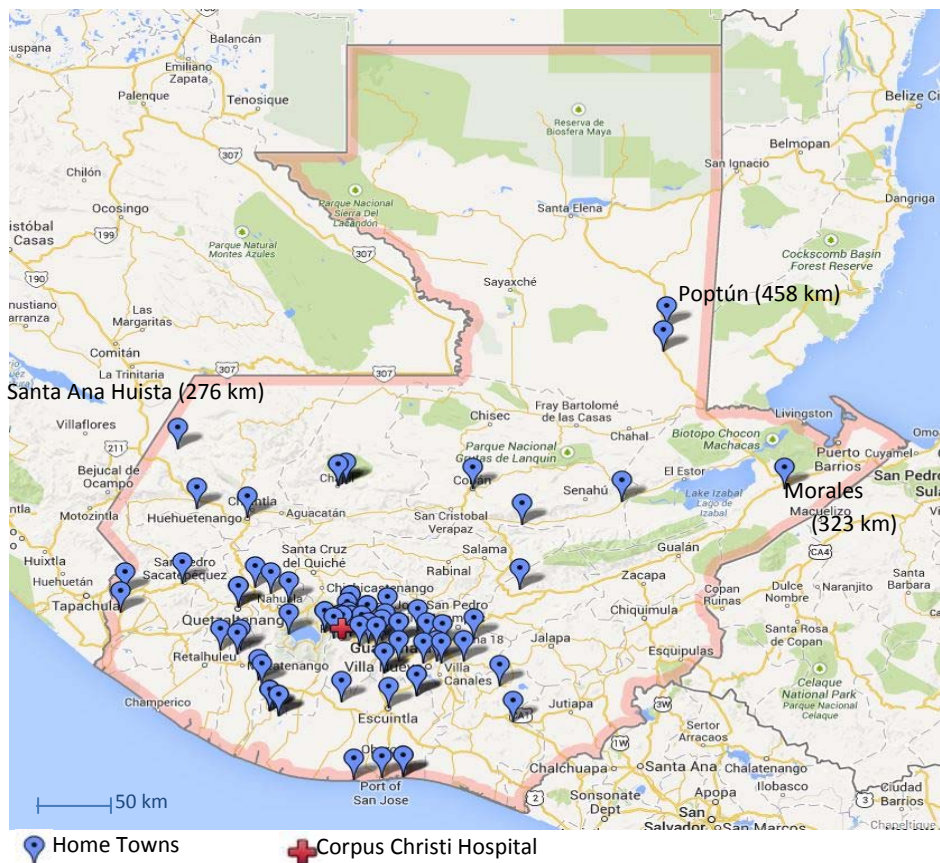
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The Healing Hands Foundation

The Healing Hands Foundation (THHF) is a non-profit organization founded in 2007 that provides medical services to children and adults around the world. The THHF mission is to provide high quality surgical care to children with complex congenital malformations in areas lacking resources and expertise. The medical staff of THHF has decades of combined experience, and its doctors, dentists and nurses have practiced medicine in countries around the world, including Ecuador, Colombia, Guatemala,

All Guatemala missions are located at the Corpus Christi Hospital in Patzún, Chimaltenango, Guatemala, which has 3 operating rooms thanks to generous funding by THHF donors and grants. Patients are either referred to THHF by other medical doctors working in the region, or added to the list during a pre-mission trip in October, where THHF medical staff examined and identified candidate patients for surgery. Patients come from all over the country to receive THHF treatment and care (See Figure 1).

Figure 1 – Distances Traveled by our Patients to reach the Corpus Christi Hospital between 2011 and 2013.



Conditions in Patients Requiring Surgery

During the 2013 mission, patients presented with conditions of the head, ear, nose, groin, body core, mouth and throat, foot, wrist and arm (Table 1). The majority of primary conditions treated by THHF surgeons were those that affected the mouth (15) and these were mostly due to cleft palate and lip. The second most afflicted areas were the ear (10), mostly due to congenital deformities such as undeveloped ear (microtia), followed by cases of the groin (7), which were mostly hernia and undescended testicle cases.

Table 3 – Cases by Body Area.

Cases by body area	No.
Head	3
Ear	10
Nose	1
Groin	7
Core	4
Mouth/Throat	15
Foot	2
Wrist	4
Arm	1
Not recorded*	3
Total	50

*all cyst or lipoma removals.

Medical Team Activities

In 2013, a total of 50 surgical procedures were performed on 49 patients. Over the past 3 missions to Patzún, the THHF surgical team has performed a total of 162 procedures on 159 patients, ranging in age from 3 months to 75 years of age (See Table 2)!

Table 2 – Procedures Performed on Patients.

Procedure	2011	2012	2013	3-Year Total
Cheloid repair	3		2	5
Cleft lip repair	7	1	5	13
Cleft palate repair	7	3	7	17
Contracture release	5	2	1	8

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Dacryo-cysto-rhinoplasty		1		1
Excisions (mass, lipoma, cyst, skin tags, etc)	6	22	7	35
Frenectomy		1	1	2
Frontal Condyloma	1			1
Hemifacial microsomia Kaban Type 1		1		1
Hernia repair (femoral)		3		3
Hernia repair (inguinal)		18	3	21
Hernia repair (umbilical)	1	2		3
Inferior earlobe repair		1		1
Lip release		1		1
Lip/nose repair/revision or Z-plasty	1	1	1	3
Lipoma or mass			10	10
Microtia / ear repair	5	5	7	17
Nasolabiablasty	1			1
Orchiopexy	1	4	4	9
Palate fistula repair/ closure		1		1
Reconstruction of jaw	1			1
Removal of Digit	2	3	1	6
Repair obstructed lacrimal conduit/ eye infection		1		1
Tonsil removal			1	1
TOTAL	41	71	50	162

Our Impact on Disease Burden

The impact that the above surgeries have on the quality of life and in extending life can be determined through the estimation of DALYs (Disability-Adjusted Life Years). The DALY is an estimate of disease burden and each DALY is defined as 1 year of quality life lost due to medical condition or disease. Surgeries correcting these conditions reduce the number of years of life lost, hence “averting” DALYs; i.e. this is the desirable effect for medical missions. The mission’s effectiveness in reducing disease burden is estimated by the cost for each DALY averted.

During the 2013 mission, surgical interventions by THHF averted 364.42 DALYs, saving over 364 years of quality of life for their patients. Overall, each procedure resulted in a savings of 7.29 years of quality life for that patient. When evaluating which procedures had the highest impact, we found that most DALYs were averted through hernia repairs and cleft palate repairs (See Table 3).

Table 3 – Number of Quality Life Years Saved (DALYs averted) through Surgical Interventions during the 2013 THHF Mission.

2013 Mission Procedures	2013 Procedures (50)	2013 DALYs averted (364.42)	2013 DALYs averted/procedure
Cleft Lip repair	4	18.13	4.53
Cleft Palate repair	7	88.70	12.67
Contracture release	1	0.12	0.12
Excisions (cyst, lipoma, etc)	19	51.60	2.72
Frenulectomy (tongue tie release)	1	0.01	0.01
Hernia repair (inguinal)	4	172.42	43.10
Lip revision or repair	1	0.00	0.00
Microtia (external ear rebuild)	7	0.00	0.00
Orchiopexy	4	33.38	8.35
Polydactyly – removal	1	0.00	0.00
Tonsil removal	1	0.06	0.06

The high impact of hernia and cleft palate repairs is due to several reasons: first, of the patient conditions presented, these carry the highest risk of death and disability should they remain untreated. Secondly, young patients who are given potentially life-saving surgery have overall more years “saved” than older patients, due to overall life expectancies which are accounted for in the DALY calculations. This means that the earlier a patient is treated, the higher the impact in reducing the disease burden. Cleft palate and lip repairs are especially impactful in children under 5. It is during ages 0 to 5 where the risk of death and disability due to cleft palate and lip is particularly high. In 2013, the average age of cleft palate and lip patients was 11.9 years.

Some conditions are not considered life-threatening or particularly disabling, so not all procedures added toward total DALYs averted. Still, microtia repairs and similar procedures have an enormous positive impact on those patients’ lives in terms of reducing social stigmas associated with deformities and improve self-esteem.

The total direct cost for the 2013 mission was \$44,847: a year of life was saved for just \$123. Our rate compares well with similar groups, and demonstrates that surgical interventions are a cost-effective means to reduce disease burden as part of public health interventions in developing countries.

Needs for Future Missions:

THHF has the following needs to expand its capacity and impact, while maintaining the highest level of quality and service.

1. Electronic Record Keeping. After 5 missions to Corpus Christi Hospital in Patzún, THHF doctors are seeing some repeat patients, and it is difficult to pull patient histories from paper files. Electronic record keeping will improve tracking and documenting patient health status and history, maintain quality and completeness of data, and streamline patient in-take process. The benefits would also be shared by the Corpus Christi hospital, and there may even be potential for health information sharing with the local Patzún health clinic, providing valuable information on patient medical histories and alerting doctors to potential hidden problems. The EMR system should:

- Have a wireless internet or an intranet service.
- Accommodate multiple users throughout the hospital
- Provide patient scheduling
- Track inventory
- Patient data protection and security
- Cloud-based data storage for HIPAA-compliance
- Very easy, intuitive interface requiring little user training.

2. Formalize Impact Evaluations. Formal data analysis and a comprehensive assessment of all THHF missions to Guatemala will help identify future needs, document effectiveness and performance, and identify new areas in which THHF can serve the community. Seek IRB approval to ensure ethical oversight and find partners for funding new projects. Needed projects:

- Evaluation of EMR system and its ability to increase productivity, patient safety, and data quality.
- Determine the major underlying health issues within the patient population that contribute to adverse outcomes and impede THHF's ability to perform surgeries on those patients (e.g. malnutrition and nutrition education), and work with local health workers to improve these conditions.
- Monitor patient outcomes during follow-up period after surgery (related to #3 below).
- Evaluate effectiveness and how to improve in terms of cost (\$) per year of life saved.
- Document effectiveness of mentoring and education to local staff and medical students (related to #4 below).

3. Determine Methods for Patient Follow-up. Identify strategies to follow patients' outcomes after THHF mission is completed.

4. Official Mentoring and Education Plan. Streamline the process and expectations for training local doctors and medical students, including both Guatemalan students and those volunteering from the U.S. Identify an application process, roles and responsibilities, training goals, and lesson plans.

Finally, continued collaboration with THHFG for logistical support is key for THHF in Guatemala. Having in-country support is tremendous and adds additional local funding to support THHF missions. The in-country support also streamlines all logistical activities, allowing the physicians and surgeons to focus on their medical work and fulfill the purpose of the mission.

Data Analysis and Assumptions

The DALY metric is calculated as $DALY = YLL + YLD$, where YLL represents years of life lost due to the condition, and YLD the years lived with disability for non-fatal conditions. To calculate YLL, we used published standard values for discounted YLL due to death, assuming death at patient's current age. A scoring system defined severity of disease and efficacy of treatment (for either life or disability) following previously established methods. Disability weights for diseases and conditions were taken from average disability weights from published sources. The patient's age and type of procedures were used to calculate DALYs averted by procedure.

Children in the developing world not only fail to receive surgery, but they also miss important post-treatments and therapy that children in the developed world receive. It is challenging to calculate cleft lip/palate DALYs over a person's life-time, because it depends on how much comprehensive care each patient receives, and how old they are when they receive it. Long-term patient follow up is needed to fully understand the impact that one THHF surgery has on increasing life span.

In addition, the Disease Control Priorities Project (DCP1) life tables suggest that the entire burden of disease from a cleft lip and palate is incurred within the first 4 years of life. The absence of disability weights for untreated cleft lip and palate after the fifth year of life does not fit with the reality of living with an unrepaired cleft lip or palate. In our analysis, we assume that disability due to cleft lip and palate is distributed across the patient's life time. In addition, in 2010 Magee et al attempted to demonstrate the cost-effectiveness of cleft lip and palate operations in the developing world, specifically through international volunteer missions, such as Operation Smile, as a vehicle for delivery. They deduced a residual disability measure to take into account the average amount of disability a patient maintains after surgery, and which we used as well in our DALY calculations.